CLAIMS

What is claimed is:

1. A thin film analysis system for analyzing a test sample, the test sample comprising a thin film formed on a substrate and a contaminant layer formed on the thin film, the thin film analysis system comprising:

an energy beam source for directing an energy beam at the contaminant layer during a cleaning operation, the energy beam being configured to remove a portion of the contaminant layer to expose an analysis area on the thin film; and

a thin film analysis module for performing a measurement operation on the thin film at the analysis area.

2. The thin film analysis system of Claim 1, wherein the thin film analysis module comprises an ellipsometry system.

3. The thin film analysis system of Claim 2, wherein the ellipsometry system comprises a single-wavelength ellipsometry system.

4. The thin film analysis system of Claim 2, wherein the ellipsometry system comprises a spectroscopic ellipsometry system.

5. The thin film analysis system of Claim 1, wherein the thin film analysis module comprises a reflectometry system.

6. The thin film analysis system of Claim 1, wherein the thin film analysis module comprises a non-contact electrical analysis system.

7. The thin film analysis system of Claim 1, wherein the thin film analysis module comprises a contact-based electrical analysis system.

8. The thin film analysis system of Claim 1, wherein the energy beam source comprises a pulsed laser.

9. The thin film analysis system of Claim 8, wherein the pulsed laser comprises a Q-switched laser.

10. The thin film analysis system of Claim 9, wherein the Q-switched laser comprises a yttrium aluminum garnet (YAG) laser.

11. The thin film analysis system of Claim 10, wherein the YAG laser operates at a wavelength of approximately 532nm.

12. The thin film analysis system of Claim 10, wherein the YAG laser operates at a wavelength of approximately 355nm.

13. The thin film analysis system of Claim 8, wherein the pulsed laser comprises a pulsed diode laser.

14. The thin film analysis system of Claim 8, wherein the pulsed laser comprises an alexandrite laser.

15. The thin film analysis system of Claim 1, wherein the energy beam source comprises a continuous laser modulated to produce a pulse.

16. The thin film analysis system of Claim 1, wherein the energy beam source comprises a laser having a pulse energy between approximately 5 to 100 μJoules.

17. The thin film analysis system of Claim 1, wherein the energy beam source comprises an optical fiber for transmitting the laser beam from an energy beam generator to the portion of the contaminant layer.

18. The thin film analysis system of Claim 1, wherein the energy beam source comprises a flashlamp.

19. The thin film analysis system of Claim 1, wherein the analysis area comprises a non-functional region of the test sample.

20. The thin film analysis system of Claim 1, wherein the analysis area comprises a length and a width, wherein the length and the width are both approximately 20μm or greater.

21. The thin film analysis system of Claim 1, wherein the thin film analysis module is configured to direct a probe beam at the analysis area during the measurement operation, wherein the probe beam is focused on a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location and the second location being substantially the same.

22. The thin film analysis system of Claim 1, wherein the thin film analysis module is configured to direct a probe beam at the analysis area during the measurement operation, wherein the probe beam is focused on a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location being different from the second location.

23. The thin film analysis system of Claim 22, further comprising a positioning mechanism for aligning the energy beam with the portion of the contaminant layer during the cleaning operation and for aligning the probe beam with the analysis area during the measurement operation.

24. The thin film analysis system of Claim 1, wherein the thin film analysis module is configured to apply a probe structure to the analysis area during the measurement operation, wherein the probe structure is aimed at a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location and the second location being substantially the same.

25. The thin film analysis system of Claim 1, wherein the thin film analysis module is configured to apply a probe structure to the analysis area during the measurement operation, wherein the probe structure is aimed at a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location being different from the second location.

26. The thin film analysis system of Claim 25, further comprising a positioning mechanism for aligning the energy beam with the portion of the contaminant layer during the cleaning operation and for aligning the probe structure with the analysis area during the measurement operation.

27. A method for analyzing a test sample, wherein a contaminant layer covers a surface of the test sample, the method comprising:

directing an energy beam at a first location on the contaminant layer, the energy beam removing a first portion of the contaminant layer to expose a first analysis area on the surface of the test sample; and

measuring the test sample at the first analysis area.

28. The method of Claim 27, wherein the surface of the test sample includes a thin film.

29. The method of Claim 27, wherein measuring the test sample comprises performing an ellipsometry analysis.

30. The method of Claim 27, wherein measuring the test sample comprises performing a reflectometry analysis.

31. The method of Claim 27, wherein measuring the test sample comprises performing a non-contact electrical analysis.

32. The method of Claim 27, wherein measuring the test sample comprises performing a contact-based electrical analysis.

33. The method of Claim 27, wherein directing the energy beam comprises applying at least one pulse from a pulsed laser to the first location on the contaminant layer.

34. The method of Claim 33, wherein the pulsed laser comprises a Q-switched yttrium aluminum garnet (YAG) laser.

35. The method of Claim 27, wherein the first analysis area comprises a non-functional region of the test sample.

36. The method of Claim 27, wherein the first analysis area comprises a length and a width, wherein the length and the width are both approximately 20μm or greater.

37. The method of Claim 27, further comprising:

directing the energy beam at a second location on the contaminant layer, the energy beam removing a second portion of the contaminant layer to expose a second analysis area on the surface of the test sample; and

measuring the test sample at the second analysis area.

38. The method of Claim 27, wherein measuring the test sample comprises directing a probe beam at the first analysis area, the method further comprising shifting the position of the test sample to align the first analysis area with the probe beam.

39. The method of Claim 38, wherein shifting the position of the test sample comprises moving the test sample parallel to the surface of the test sample.

40. The method of Claim 38, wherein shifting the position of the test sample comprises rotating the test sample around an axis perpendicular to the surface of the test sample.

41. A thin film analysis system for analyzing a test sample, the test sample comprising a thin film formed on a substrate and a contaminant layer formed on the thin film, the thin film analysis system comprising:

means for directing an energy beam at the contaminant layer during a cleaning operation, the energy beam removing a portion of the contaminant layer to expose an analysis area on the thin film; and

means for performing a measurement operation on the thin film at the analysis area.

42. The thin film analysis system of Claim 41, wherein the thin film analysis module comprises means for performing at least one of ellipsometry analysis, reflectometry analysis, non-contact electrical measurement, contact-based electrical measurement, grazing-incidence x-ray reflectometry, and electron microprobe analysis.

43. The thin film analysis system of Claim 41, wherein the means for directing the energy beam comprises a Q-switched yttrium aluminum garnet (YAG) laser.

44. The thin film analysis system of Claim 41, wherein the means for performing a measurement operation comprises means for directing a probe beam at the analysis area during the measurement operation, wherein the probe beam is focused on a first location on the test sample and the energy beam is focused

on a second location on the test sample, the first location and the second location being substantially the same.

45. The thin film analysis system of Claim 41, wherein the means for performing a measurement operation comprises means for directing a probe beam at the analysis area during the measurement operation, wherein the probe beam is focused on a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location being different from the second location.

46. The thin film analysis system of Claim 45, further comprising means for aligning the energy beam with the portion of the contaminant layer during the cleaning operation and for aligning the probe beam with the analysis area during the measurement operation.

47. The thin film analysis system of Claim 41, wherein the means for performing a measurement operation comprises means for applying a probe structure to the analysis area during the measurement operation, wherein the probe structure is aimed at a first location on the test sample and the energy beam is focused on a second location on the test sample, the first location and the second location being substantially the same.

48. The thin film analysis system of Claim 41, wherein the means for performing a measurement operation comprises means for applying a probe structure to the analysis area during the measurement operation, wherein the probe structure is aimed at a first location on the test sample and the energy beam is focused

on a second location on the test sample, the first location being different from the second location.

49. The thin film analysis system of Claim 48, further comprising means for aligning the energy beam with the portion of the contaminant layer during the cleaning operation and for aligning the probe structure with the analysis area during the measurement operation.

50. A processed wafer comprising a thin film formed over a substrate, the processed wafer further comprising a contaminant layer formed over the thin film, wherein the contaminant layer includes an opening over an exposed portion of the thin film, the exposed portion of the thin film being large enough to allow a thin film analysis to be performed in the thin film layer.